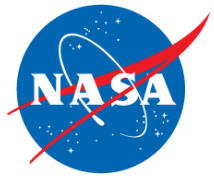

Derived Meteorological Product and Jet/Tropopause Characterization work for the ACE community

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Processing

Streams

- Derived Meteorological Products
- Tropopause Characterization
- Equivalent Latitude
- Jets Classification

Elements of the first 3 processing streams are combined to formed what the ACE-FTS community knows as DMPs.

Processing (a bit of history)

- @ Satellites
  - Lat-Lon-Alt-Time information from the satellite measurements ACE, MLS, HIRDLS,...
- @ Station
  - Lat-lon (fixed time for all meteorological levels)
  - More than 60 stations: Boulder, Eureka, Kiruna, ...
- @ Generic
  - Lat-Lon-Time-Alt Specified by the user

Derived Meteorological Products

Simply the meteorological conditions (and some products derived from them) interpolated to the measurements' times and locations.

- Pressure
- Temperature
- Geopotential Height
- Meridional Wind
- Zonal Wind
- Potential Temperature
- Potential Vorticity (PV)
- Scaled Potential Vorticity
- Relative Vorticity
- Lapse Rate
- Static Stability

Tropopause Characterization

WMO Tropopause

Dynamical Tropopause (2.0, 3.5, 4.5, and 6.0 potential vorticity units)

Information at the tropopauses

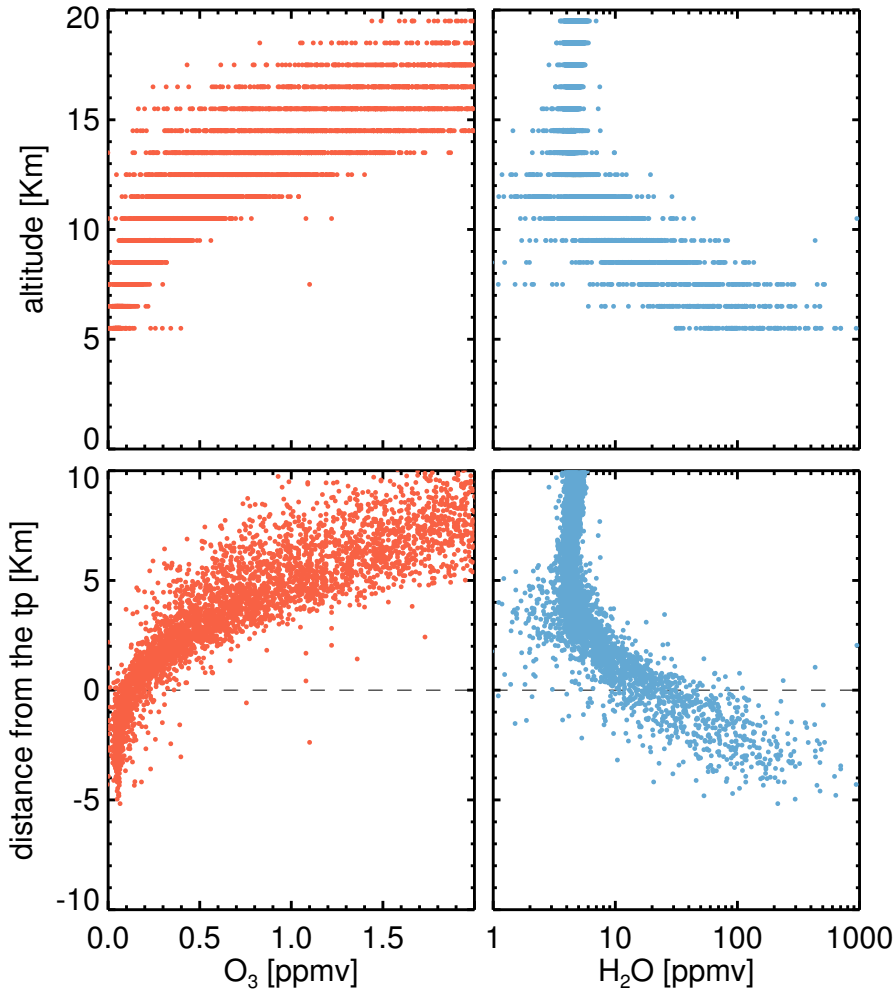
- Number of tropopauses
- Altitude
- Pressure
- PV
- θ
- Static Stability
- Lapse Rate

Tropopause Characterization

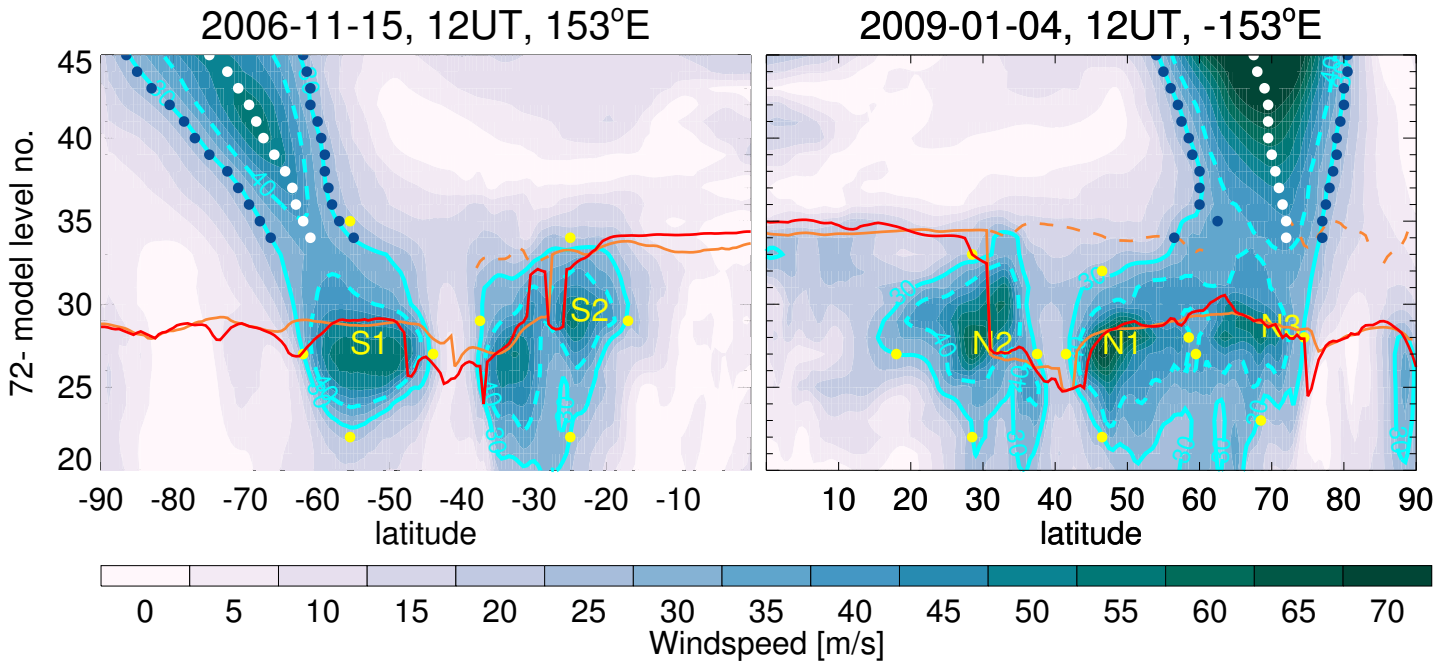
ACE-FTS vertical profiles of O_3 and H_2O obtained between December 2008 and February 2009 at latitudes between 50° N and 70° N.

The profiles are shown as a function of altitude (top) and as distance from the thermal tropopause (bottom).

Figure based on Hegglin et al. [2008].



Jet Classification



Cross-sections of windspeed with jet and tropopause classification information overlaid.
Based on Figure 2 from Manney et al. [2011]

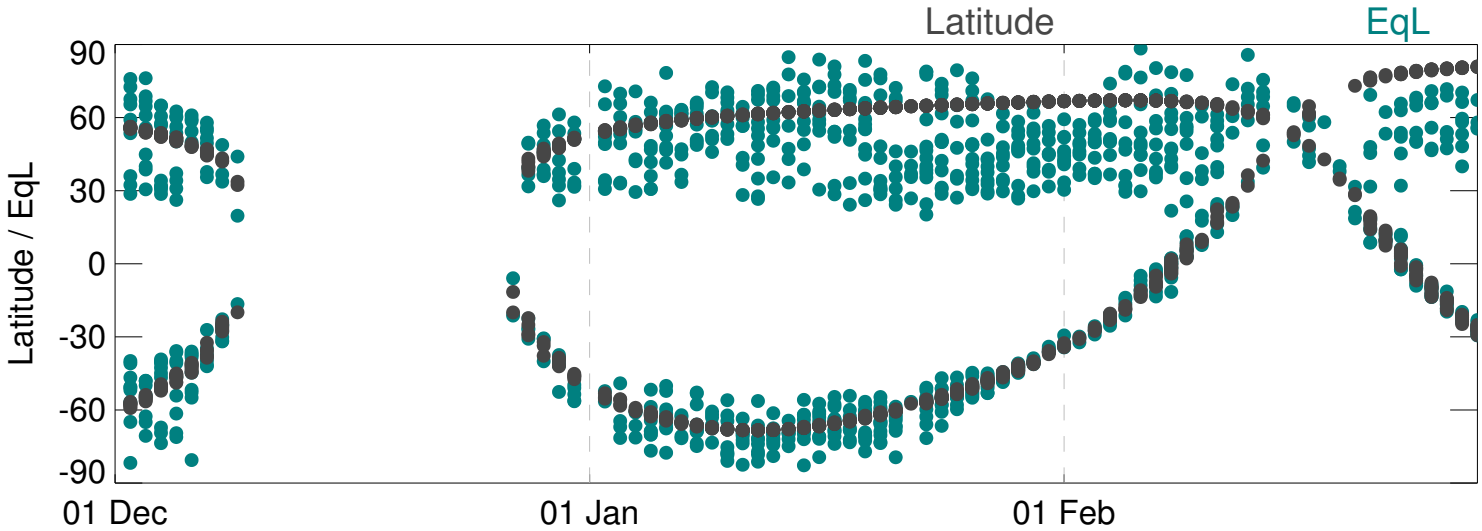
Equivalent Latitude

Performed on isentropic surfaces

Equivalent Latitude
Normalized Horizontal (Isentropic) PV Gradient
Horizontal (isobaric) Temperature Gradient
Montgomery Stream Function*
Assimilated O_3*

*New derived products

Equivalent Latitude



ACE-FTS measurements as a function of latitude and time as well as a function of EqL and time for December 2004 through February 2005.

Available Reanalyses

Reanalyses	Grid	# levels	Lid Height
ERA-Interim	0.75°x0.75°	60	0.1 hPa
NCEP-CFSR	0.5°x0.5°	64	$\sim$0.26 hPa
JRA-55	$\sim 0.56^{\circ}$x0.56°	60	0.1 hPa
MERRA	0.66°x0.5°	72	0.01 hPa
MERRA2	0.625°x0.5°	72	0.01 hPa

Note that by default we will use MERRA2.

ACE-FTS processing

We have unified the algorithms to use @generic as foundation

We have run using Patrick's netcdf mission long files* as inputs (both GLC and non-GLC)

These files are currently under inspection

Outputs will be in netcdf4

*Delivery of these ACE-FTS mission-long netcdf files to us needs to be discussed.

ACE-FTS delivering

Delivery will be through the MLS website:

- using an interface / access protocol similar to that for the MLS DMPs.

Users will need to register once

- We will be able to collect a list of users
- Data will be truly public

Currently only the DMPs, EqL and the tropopause information will be delivered.

The jet classification will be available upon request.

Reanalysis comparisons of UTLS jets and multiple tropopauses

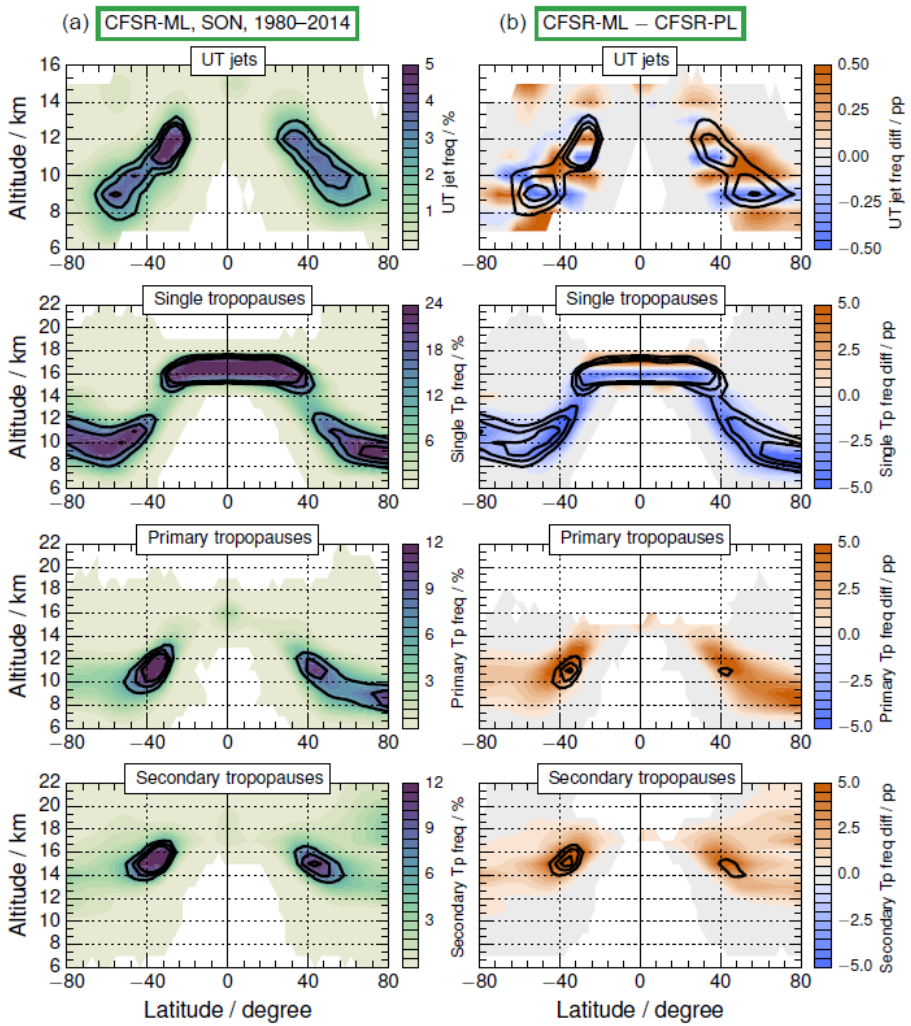
Manney et al. (2017)

The rows show:

- the upper tropospheric jet frequency
- single tropopause frequency
- frequency of primary multiple tropopause
- frequency of secondary multiple tropopause

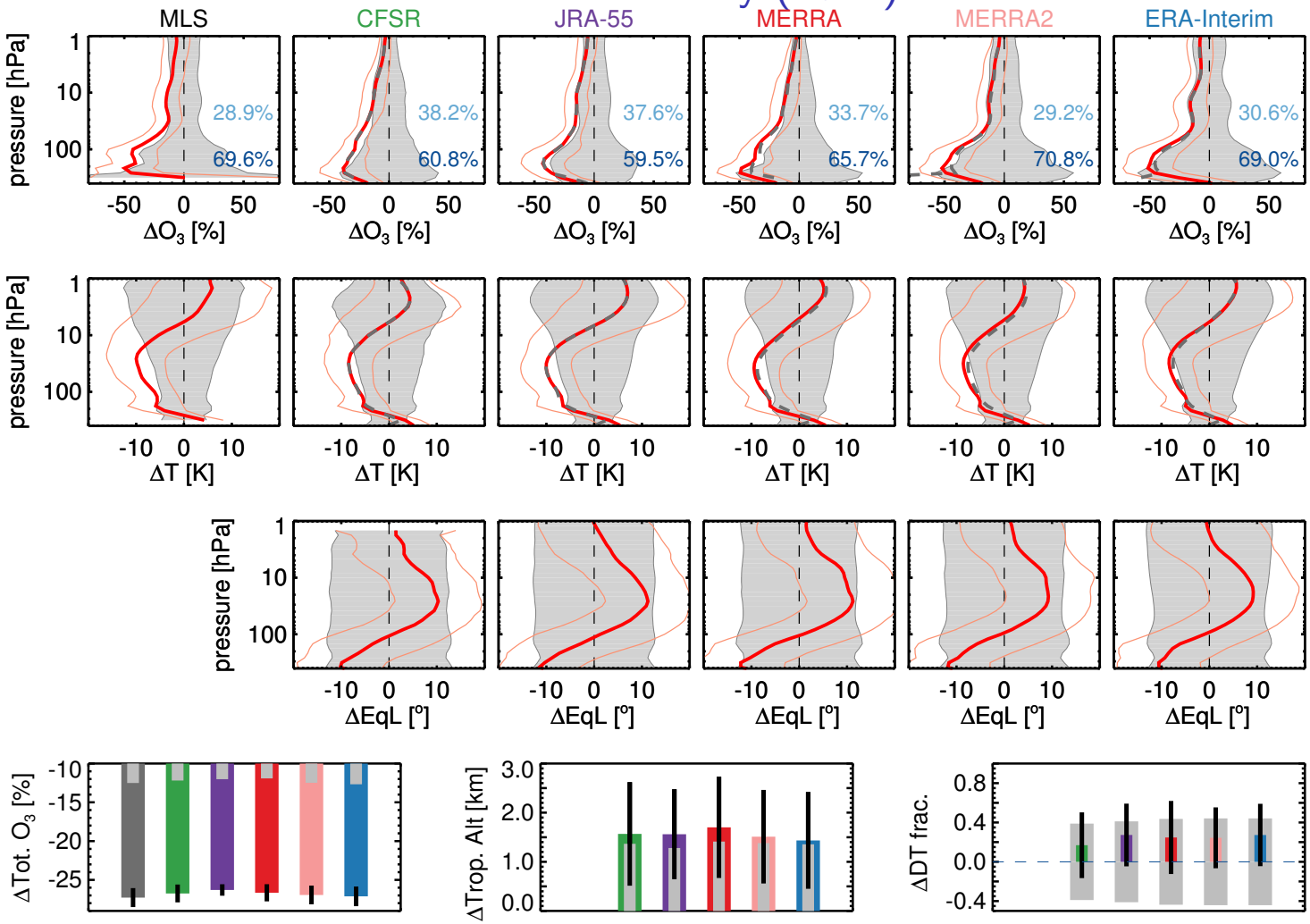
In the difference plots, blues/oranges indicate negative/positive differences.

Figure 4 from Manney et al. (2017)



Assessment of Ozone Mini-holes

Millan and Manney (2017)



Composite of the difference between the events and the reference values for all mini-hole events found between 2005 and 2014.
Figure 9 from Millan and Manney (2017)

A global, space-based stratospheric aerosol climatology: 1979 to 2016

Thomason et al. (2017)

The rows show:

a) 1984-2005 with SAGE II only

b) SAGE II, CLAES, HALOE, Lidar, no interpolation

c) with interpolation

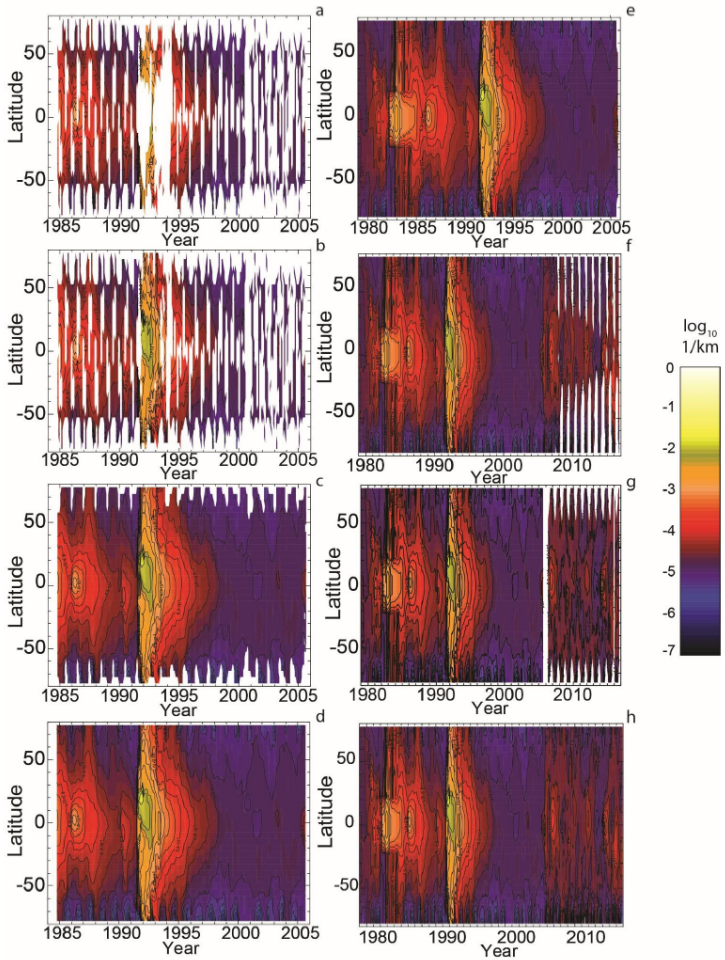
d) **with high latitude reconstruction**

e) 1979 to 2005 with the pre-SAGE II era data from SAGE, SAM II, airborne and ground-based lidar

f) 1979 to 2016 adding only OSIRIS

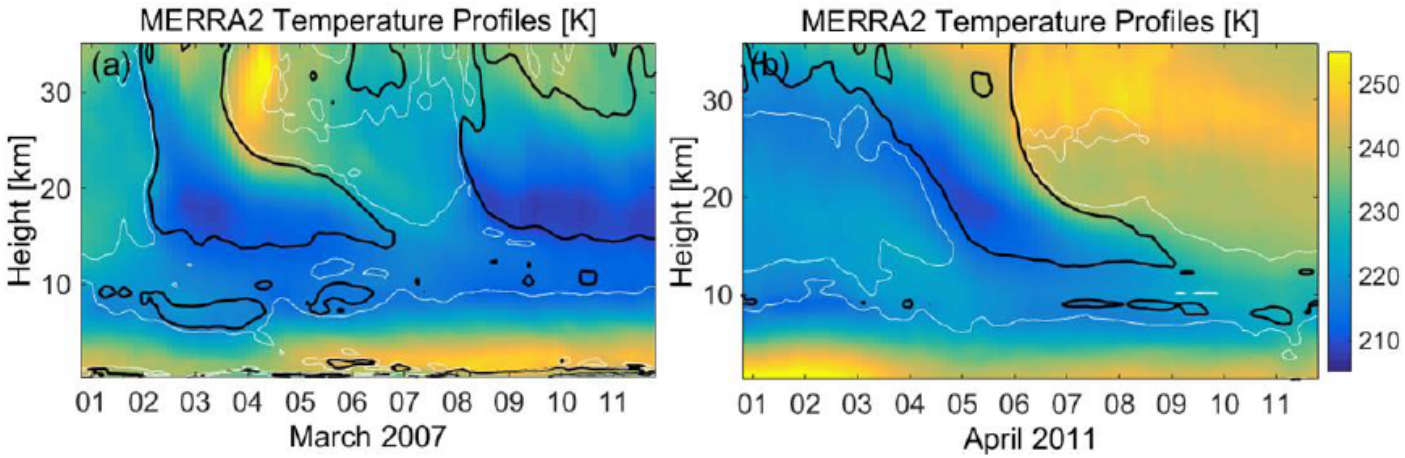
g) 1979 to 2016 adding only CALIPSO

h) 1979 to 2016 adding both OSIRIS and CALIPSO and producing the final product



Cyclone-Induced Surface Ozone and HDO Depletion in the Arctic

Zhao et al. (2017)



Vertical temperature profiles over Eureka from MERRA-2.
The black contour indicates the inner boundaries of the polar vortex determined by sPV = 1.6 x 10^{-4} s^{-1}, and the white contour indicates the outer boundaries (sPV = 1.4 x 10^{-4} s^{-1}).
Figure 13 from Zhao et al. (2017).

Proposals

NASA MEASURES proposal

Dynamical Remapping of UTLS Multi-platform Composition Observations for Research and Process Studies (DRUM-CORPS)

Proposed by Gloria Manney

- Expand these diagnostics to include Hadley Cell
- Run DMPs, tropopauses and jets for several satellite instruments, ozonesondes, lidars, airplane measurements
- Use these meteorological products to produce composition datasets mapped into dynamical coordinates

NASA ROSES 2017

SAGEIII/ISS Dynamical Diagnostics

Proposed by Luis Millan

- Run DMPs, tropopauses and jets for SAGEIII/ISS
- Launch trajectories from SAGEIII/ISS measurements
- Implement a non-coincident validation SAGEIII/ISS measurements

Talk to us if you are interested in using any of these products.

Many of them are going to be publicly available soon.

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